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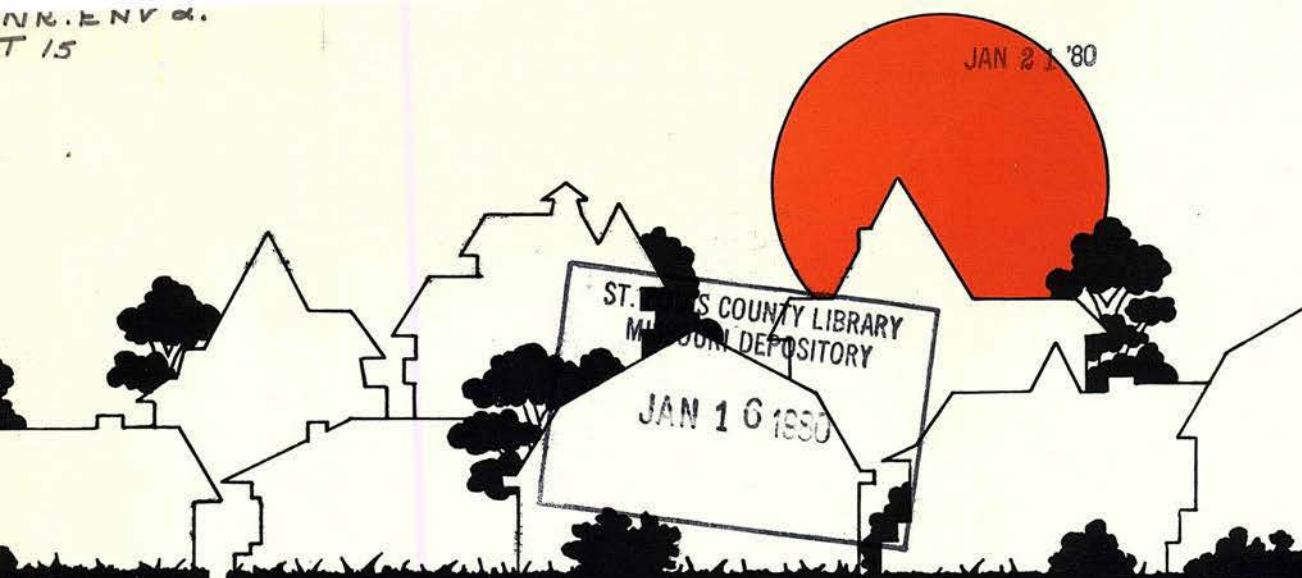


Missouri Homeowners Guide To Septic Tank Use

This guide is designed primarily to answer the question: Is the septic tank sewage disposal system the best answer to my needs?

Missouri Department of Natural Resources
in cooperation with
Missouri Division of Health
July 1979

The septic tank was one of the earliest primary treatment devices. It works by holding sewage at a very low velocity for a period of at least 24 hours during which solids settle to undergo decomposition in the bottom of the tank. As decomposition takes place under anaerobic conditions, gases are formed causing some of the solids to rise to the surface to escape with the effluent. Because some solid matter escapes, septic tank treatment is an imperfect primary at best. Sewage leaves the tank in a septic condition which, because it is mixed with partially decomposed matter, also makes treatment in secondary units difficult. A closed underground absorption field is a must.

Septic tank sewage disposal systems have been used in Missouri for several decades. Although in concept the septic tank sounds like a good idea, primary waste treatment alone becomes less desirable every day as the population continually increases. Also, septic tanks will not function properly at all times, in all places, and not without periodic maintenance.

No attempt will be made in this guide to discuss the various considerations regarding size, capacity, or engineering of the individual system; expert help should be sought to design your system. Professional guidance in selecting a site for and designing a properly functioning septic tank disposal system or in determining the feasibility of using such a system is available from: the Missouri Division of Health, your local health department sanitarian, Missouri Division of Geology and Land Survey, Missouri Division of Environmental Quality, Soil Conservation District Office or the Extension Center in your area. **This guide is designed primarily to answer the question: Is the septic tank sewage disposal system the best answer to my needs?**

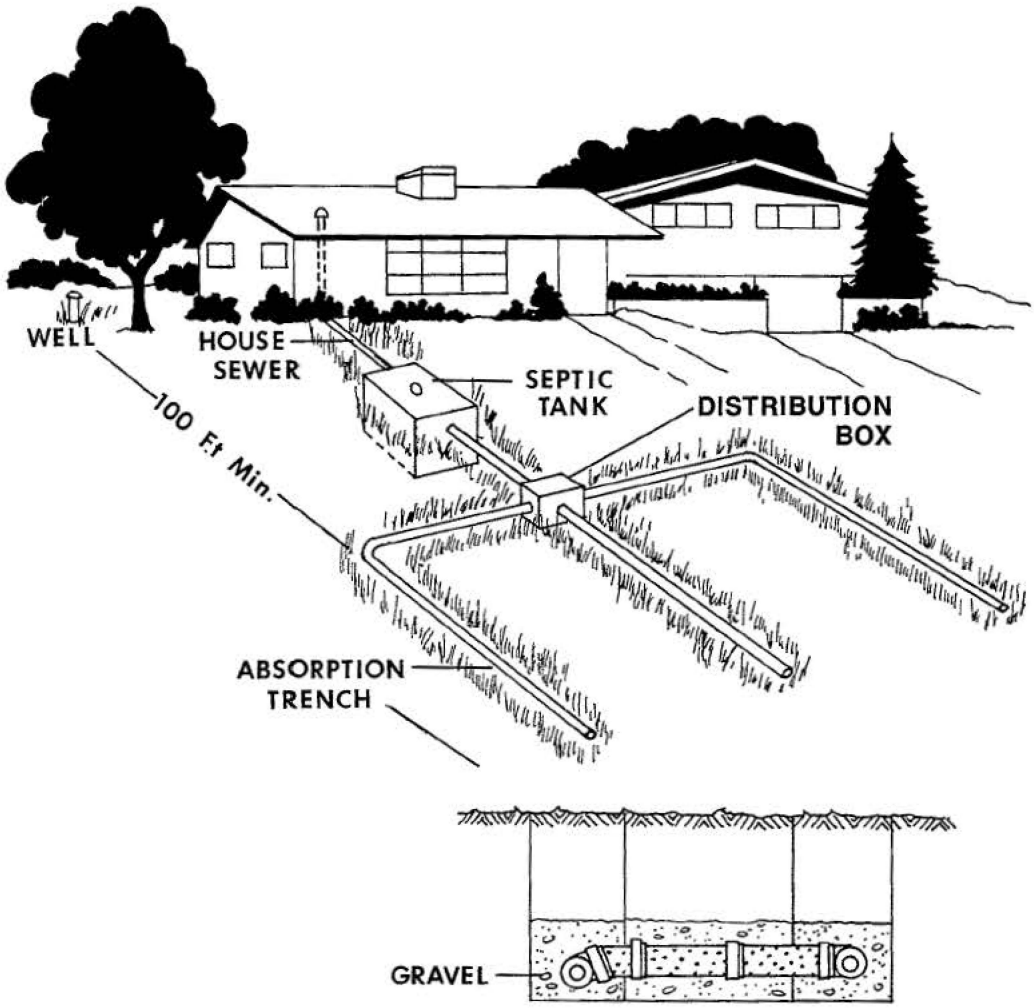
Present State Statutes and Regulations

In Missouri only a few statutes or regulations affect the use of septic tanks by individual homeowners. A comprehensive statewide control of septic tank usage doesn't exist but such a law may become necessary in the future.

One reference which applies to septic tanks can be found in the *Missouri Clean Water Law* (Section 204.011). This section states that any pollution of the waters of the state of Missouri (pollution meaning anything that interferes with the physical, chemical, or biological integrity or the beneficial uses of the water) will not be tolerated. It also states that wastewater must undergo necessary treatment to protect legitimate beneficial uses of water and to meet the requirements of the federal Water Pollution Control Act as amended.

The words "necessary treatment to protect beneficial uses" are very important. The mere construction of a septic tank does not guarantee this; many factors must be considered before a septic tank sewage disposal system is decided upon. A septic tank provides only primary treatment which is not sufficient for discharge into state waters. Other considerations will be dealt with later in this guide.

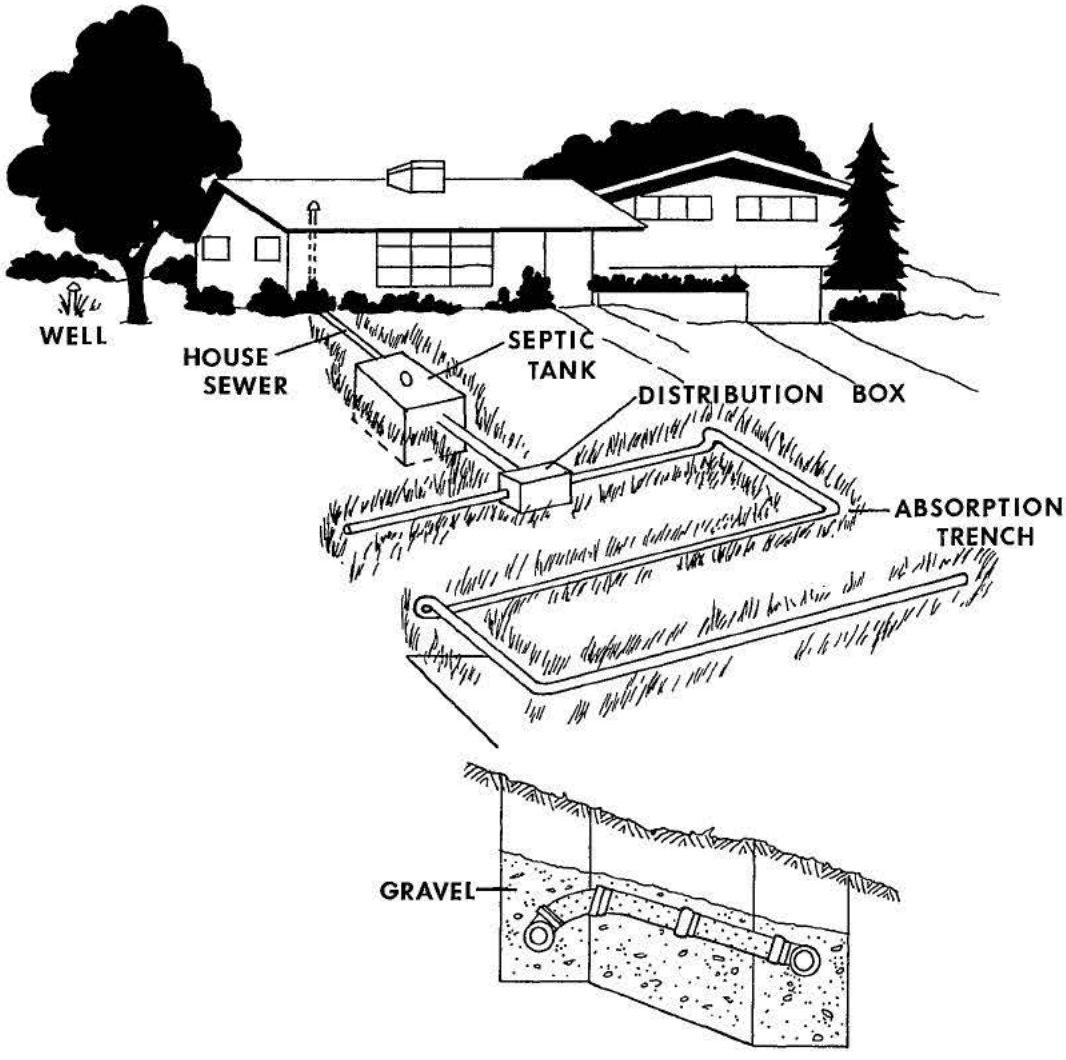
Another reference is made in the code of state regulations 10 CSR 20-6.030, *Disposal of Wastewater in Subdivisions.* This set of regulations applies to subdivisions ("any land which is divided or proposed to be divided into 10 or more lots. . .") and makes different provisions for new or existing subdivisions at the time the regulations took effect. There is one provision within these regulations that applies to the individual homeowner living in a subdivision: ". . .owner(s) or persons(s) controlling any single-family dwelling wastewater treatment facilities on or after the effective date of this regulation, whether then in existence or installed in the future, shall eliminate such facility and connect the dwelling to a municipal or public sewer district sewer system or a



Typical septic tank waste disposal system on level ground. If there is 6 inches or more of fall within the absorption field use layout for sloping ground.

sewer system regulated and certified by the Missouri Public Service Commission at any time any part of such a system is located within one hundred (100) feet of a dwelling or facility, whichever is closer, unless, in the opinion of the agency, connection thereto is not feasible. . ."

Regulation 10 CSR 20-8.020, *Design of Small Sewer Works,* is a recommendation or guideline and makes no provisions requiring permits or inspections for systems used by the individual homeowner. Although this regulation is not strictly enforced, the guidelines for proper construction and design of septic tank waste disposal systems set forth by the Clean Water Commission should be adhered to. Following these guidelines will guarantee a properly functioning system that will operate efficiently with the least amount of problems.



On sloping ground the absorption field should be constructed parallel to the ground contour and each trench should be laid level. The trenches must be connected in such a manner that a trench will be filled with sewage to the depth of the gravel before flowing to the next lower trench. There should not be any opening or discharge from the end of the absorption field. Contact a local specialist for additional construction details.

The Missouri Division of Health has statuatory authority that could affect the use of septic tank disposal systems; however only guidelines have been established. Unless a health menace results from the system no real authority can be exercised. Once a health menace has been found,—well water contamination or surfacing septic tank effluent—correction of the problem may be several times the cost of the initial outlay for construction and maintenance of a properly designed system.

Check with your county or municipal government about its local authority to control the disposal of wastewater within their jurisdiction before planning a septic tank waste disposal system.

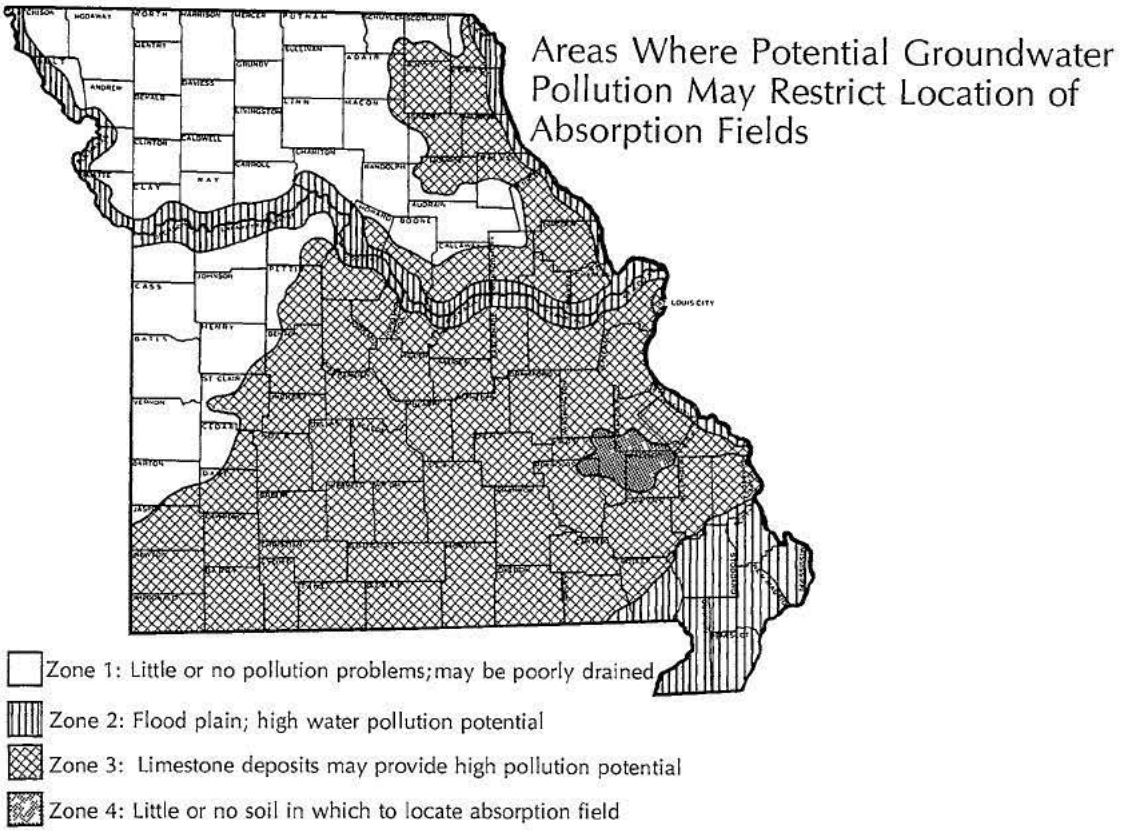

Areas Where Potential Groundwater Pollution May Restrict Location of Absorption Fields
Zone 1: Little or no pollution problems; may be poorly drained
Zone 2: Flood plain; high water pollution potential
Zone 3: Limestone deposits may provide high pollution potential
Zone 4: Little or no soil in which to locate absorption field

Figure 1.

Consider General Geological Conditions

Septic tanks and their absorption fields represent a potential threat to the quality of water above and especially below the ground surface in a large portion (50 percent) of Missouri. Figure 1 outlines the general areas of the state that may restrict location of absorption fields due to potential groundwater pollution problems. It is wise to consult experts when locating a septic tank, but if you are planning a system in area 2, 3, or 4 never locate a septic tank and absorption system without seeking professional guidance.

Areas that represent extremely hazardous geological conditions and make location of septic tanks and absorption fields generally inadvisable are outlined in figure 2. Areas of shallow residual or variable thickness soil over carbonate bedrock are hazardous because soil properties and thickness may not be adequate to remove pollutants, and the chemical action of water may remove sizable amounts of the bedrock itself, allowing subsurface collapse and the formation of sinkholes. The capability of water to quickly remove the bedrock could cause a spetic tank absorption field to also pollute subterranean waters. Karst areas, with their caves, sinkholes, and high rate of internal drainage, provide a situation where location of an absorption field could be tantamount to direct dumping into subsurface waters. Eventually seeps and springs bring this polluted water to the surface. Any area where the minimum depth to the groundwater is less than 4 feet, or where impervious strata is less than 4 feet below the bottom of the tile trench, is generally unsuited for use as a septic tank absorption field. In many cases more than 4 feet is necessary to prevent groundwater pollution.

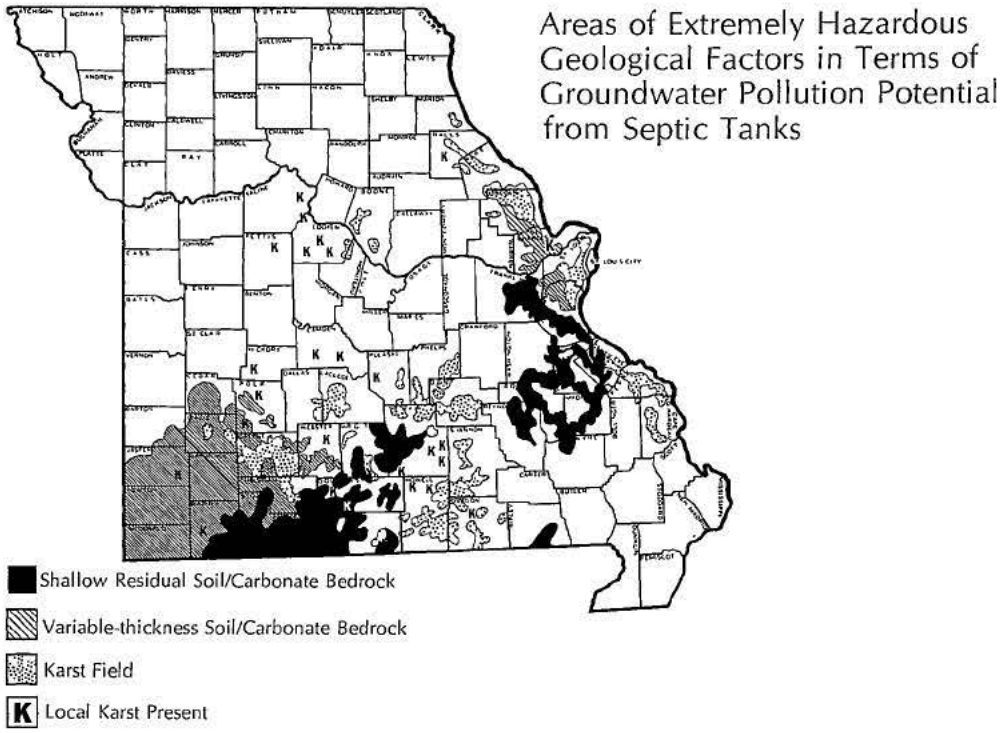

Areas of Extremely Hazardous Geological Factors in Terms of Groundwater Pollution Potential from Septic Tanks
Shallow Residual Soil/Carbonate Bedrock
Variable-thickness Soil/Carbonate Bedrock
Karst Field
K Local Karst Present

Figure 2.

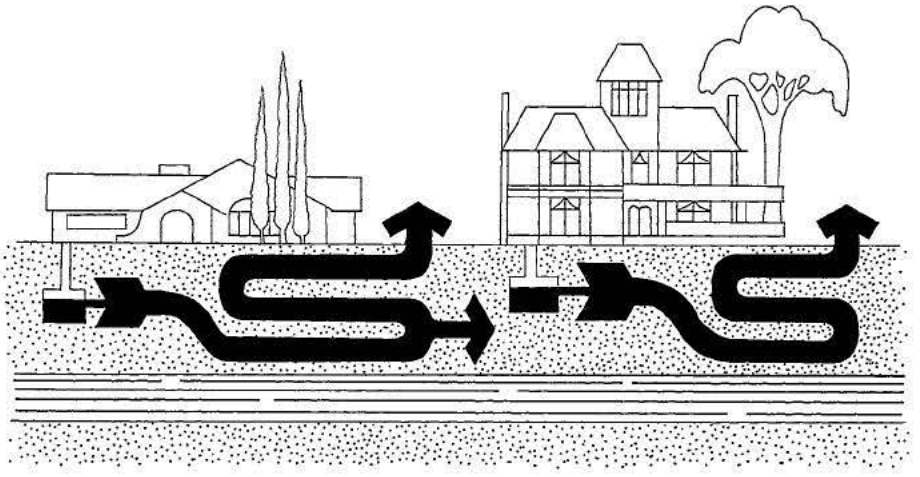
Soil Types: An Important Consideration

If the soil type is unsatisfactory, the septic tank absorption field will not function properly no matter how good the construction. A system which was designed perfectly and installed properly in one location may not function to any degree in another. Failure of a septic tank waste disposal system is most common in the absorption field.

The soil must have the capacity to take up the liquid effluent. If it does not, the sewage may come to the soil surface or may reach the groundwater below. Unfiltered sewage can quickly pollute groundwater and surface water, give off foul odors, become a health hazard, and attract disease-carrying pests and annoying insects. Knowing the absorption capacity of the soil will aid in determining the size of the absorption field to adequately handle the volume of waste. Some soils will not work as septic tank absorption fields no matter how large the field. Generally a lot size of at least 3 to 5 acres is recommended to handle a system for single dwelling usage.

The soils in your area may not be suitable, if you have one of the following soil limitations:

- Soils are wet or poorly drained.
- Soils may be too compact with a subsequently slow absorption rate.
- Land may be too steeply sloped; generally over 15% slope limits its use as an absorption field.
- The water table may be periodically or constantly too high.
- Soil over the underlying bedrock may be too shallow or have too high of an absorption rate allowing pollutants to reach the groundwater.
- The soil may be too shallow over an underlying cemented soil layer.
- The area may be periodically flooded.



A hardpan subsoil restricts the percolation of effluent discharge. As a result, septic tank pollutants sometimes appear on the land surface or may seep laterally into poorly constructed wells.

What a Soil Survey Can Do to Help

Unfortunately not all counties in Missouri have a modern soil survey. When available, a soil survey can be an invaluable aid in your planning. For the status of a soil survey in your county or area contact the local office of the Soil Conservation Service.

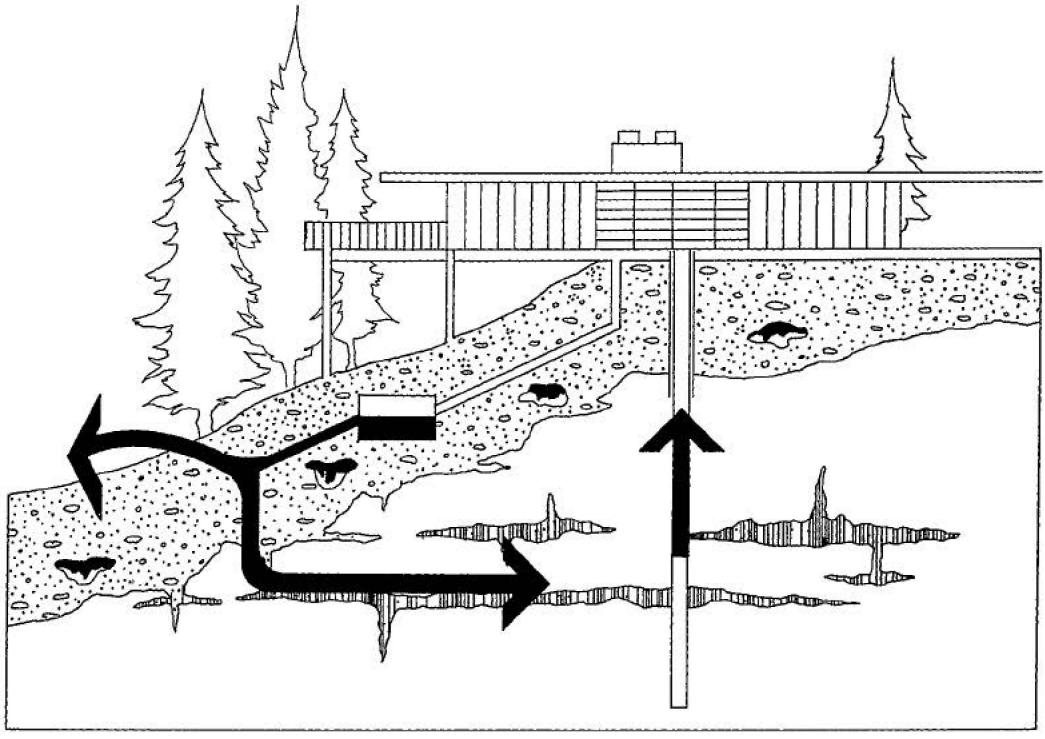
Soil surveys generally include descriptions of soils, interpretations on the uses of specific types of soil, and maps showing the location and extent of the various types within the survey area.

For the beginner, the soil survey may pose a few problems in the interpretation of the information. If you encounter problems, notify the office of your local soil and water conservation district or Extension; they will be glad to help you in understanding them.

Surveys can be used to predict the advisability or inadvisibility of a septic tank absorption field with reasonable accuracy. Soil maps are reliable for making predictions of soil capabilities over an area of several acres. It may not be specific enough to accurately judge a particular building site. On-site evaluation by a soil scientist or other qualified professional should always be sought.

Soil limitations for use of septic tank absorption fields are generally expressed as slight, moderate, or severe. A slight rating means that the soils have properties that lend themselves favorably for use as absorption fields. The soil depth above the bedrock, the slope, and the permeability of the soil are among these properties. A moderate rating means that the soils have some properties that in some way limit their ability as an absorption field or that the construction of the sytem must be altered in some way to compensate for a certain limitation of the soil. Severe ratings mean that the properties of the soils are such as to make their use as an absorption field inadvisable for any of a variety of reasons (slope, wetness, flooding, a proper sytem would be too costly).

The most important of limiting factors is the permeability of the soil. This involves the capability of the soil to allow air or water to move through it. Whether a soil contains certain amounts of gravel, sand, silt, or clay materials will greatly affect its permeability. For proper functioning of an absorption field, soil permeability must be such that the percolation rate ranges from moderate to rapid: at least one inch per hour. However, in shallow soils too rapid a percolation rate may not allow time for the soil to remove the pollutants, therefore allowing pollutants to enter groundwaters.



Stony clay soil, such as soil in central and southern Missouri, is permeable and readily permits the movement of wastewater through soil into underlying cavernous bedrock, where it may enter wells, springs, or streams.

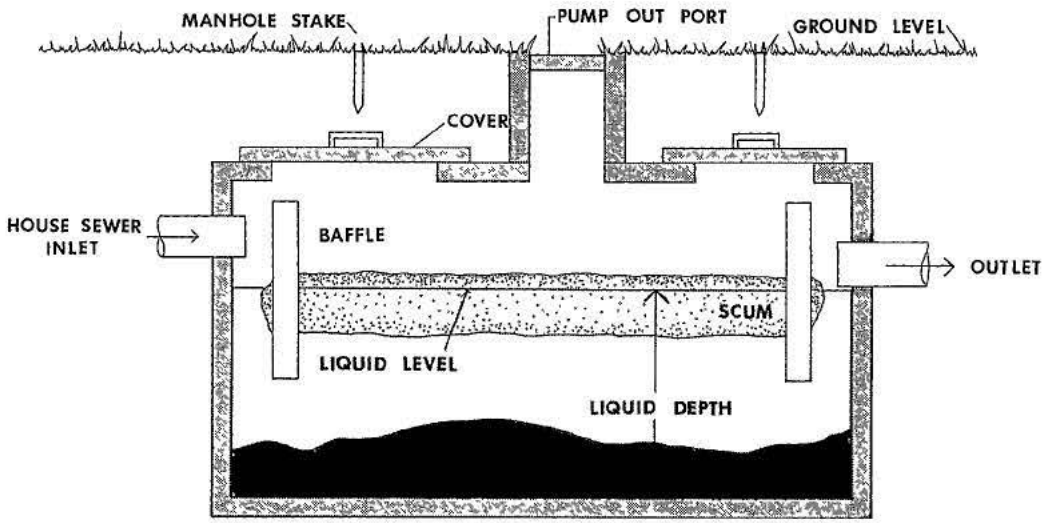
Proper Maintenance of a Septic Tank System

Annual Inspection—check scum and sludge accumulations. Scum (floating materials) can be measured by pulling a flat board attached to the end of a stick up through the scum layer. Sludge (settled solids in the bottom of the tank) can be measured by use of a long pole with toweling fastened around it. Sludge adheres to the toweling for easy reading of depth. If possible, both of these readings sould be made between the inlet and outlet baffles.

Cleaning of Septic Tanks—necessary in all cases without exception. This consists of pumping out the solid contents of the tank. Be sure that your septic tank has an access port at the ground surface. Cleaning should take place any time the total depth of sludge and scum exceeds one third of the capacity of the tank itself. If cleaning is necessary, check your local yellow pages or ask your local health department to recommend someone who does this type of work. The septic tank pumpage must be disposed of at an approved site. Sludge sticking to the sides of the tank after it has just been cleaned will have a seeding effect and assist the renewal of bacterial action; septic tanks therefore should never be scrubbed clean.

Never enter an empty or partially empty septic tank. The tank may contain dangerous gases or be absent of oxygen (may cause gas poisoning, asphyxiation, suffocation or possibly explosion). When inspecting, cleaning, or maintaining the septic tank or tile field, wear rubber gloves and after finishing the task immediately wash with soap or disinfectant. If is best to clean septic tanks in late spring because bacterial action proceeds faster in warm weather. Frequency of cleaning will vary between 2-5 years depending on:

- Size of the tank.
- Daily waste input from the home.
- Efficiency of the system.



CROSS SECTION OF A TYPICAL SEPTIC TANK

For easy cleaning, the septic tank should have a 6-8 inch access port at ground level. The larger manholes can be buried since these will be used only if repairs are needed. Septic tanks should be constructed of steel, concrete, or fiberglass. If fiberglass is used, a concrete slab should be placed on top for added strength. Barrels or porous concrete blocks are not acceptable.

Absorption fields can function without any maintenance for many years **if your septic tank is properly maintained.** Experience has shown that the average life of an absorption field is about 10 years and the maximum life is about 20 years. When the septic tank is neglected it will eventually fill up with solids and some of these solids will flow out into the absorption field. When this occurs it will only be a matter of time until the flow of liquid is stopped. Uncovering, cleaning out, and replacing the tile absorption field is very expensive when compared to the low cost of proper septic tank maintenance.

Note: No additives (chemicals, enzymes, or yeasts) on the market have been proven beneficial in testing programs, nor will they reduce solids in a septic tank system to a point where septic tank cleaning is unnecessary. In some cases additives can cause clogging up of the system.

Proper Use of Your Septic Tank—an important part of proper maintenance. Items not normally considered sewage should not be placed in a septic tank system. Garbage doesn't constitute a problem, although this should be considered in selection of the tank size. Any wastepaper (excluding toilet paper), disposable diapers, rags or similar materials should not be allowed. Such items decompose slowly and will fill up the tank quickly, resulting in the need for more frequent cleaning, or early and unnecessary failure of the system. Soaps, solvents, disinfectants, and similar household materials are not harmful to the system unless used in large quantities. However, salt from water softening units tends to retard the bacterial action within the septic tank and causes clogging within the absorption system. Brine water, therefore, should not be discharged to a septic tank system.

Knowing Your System—this includes having a detailed diagram of the system. This detailed diagram can be an invaluable aid to the homeowner as well as the home buyer. If any part of the system should fail, a lot of time, work, and money can be saved by knowing exactly where to dig to uncover and correct the problem. The prospective home buyer can use the diagram in determining if the system will function as a safe, effective method of waste disposal or be a health hazard and a burdensome expense.

Septic tanks and the tile absorption fields are frequently damaged by the movements of heavy equipment over the area under which they are located. Here again, the diagram can be a helpful companion. Heavy equipment can be guided away from the area, or if repeated crossings are necessary directly over the area, those sections of the line should be dug up and replaced with cast iron pipe.

Knowing the location of all the components in your septic tank waste system can not only be a valuable aid by showing where to dig, if that should become necessary, but in general maintenance of the area. Brush, shrubbery, and trees should not be permitted to grow over any part of the tile absorption field. Sunlight is beneficial to the system so it is best to seed the area to grass.

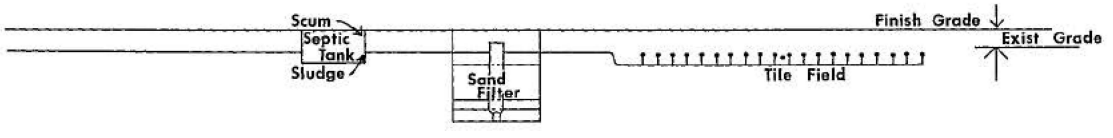
Correcting a Clogged Absorption Field—A local specialist should be contacted to determine the cause. An absorption field may become clogged for several reasons. Often the roots of trees, bushes, and shrubs may enter the tile lines, blocking the flow of effluent and forcing it through the ground surface. If this should occur the roots can only be removed safely by digging up and cleaning the tile lines.

Septic tank solids may have overflowed into the absorption field and clogged the soil pores thus reducing the absorption rate. This can occur because the septic tank has not been cleaned out regularly, or because of the normal failure of the absorption field after 10 to 20 years. In either case, the best solution is to construct a new absorption field and allow the old field to rest and renovate itself through natural processes. The new field should be constructed so that the old and new fields can be alternated every 2 to 3 years.

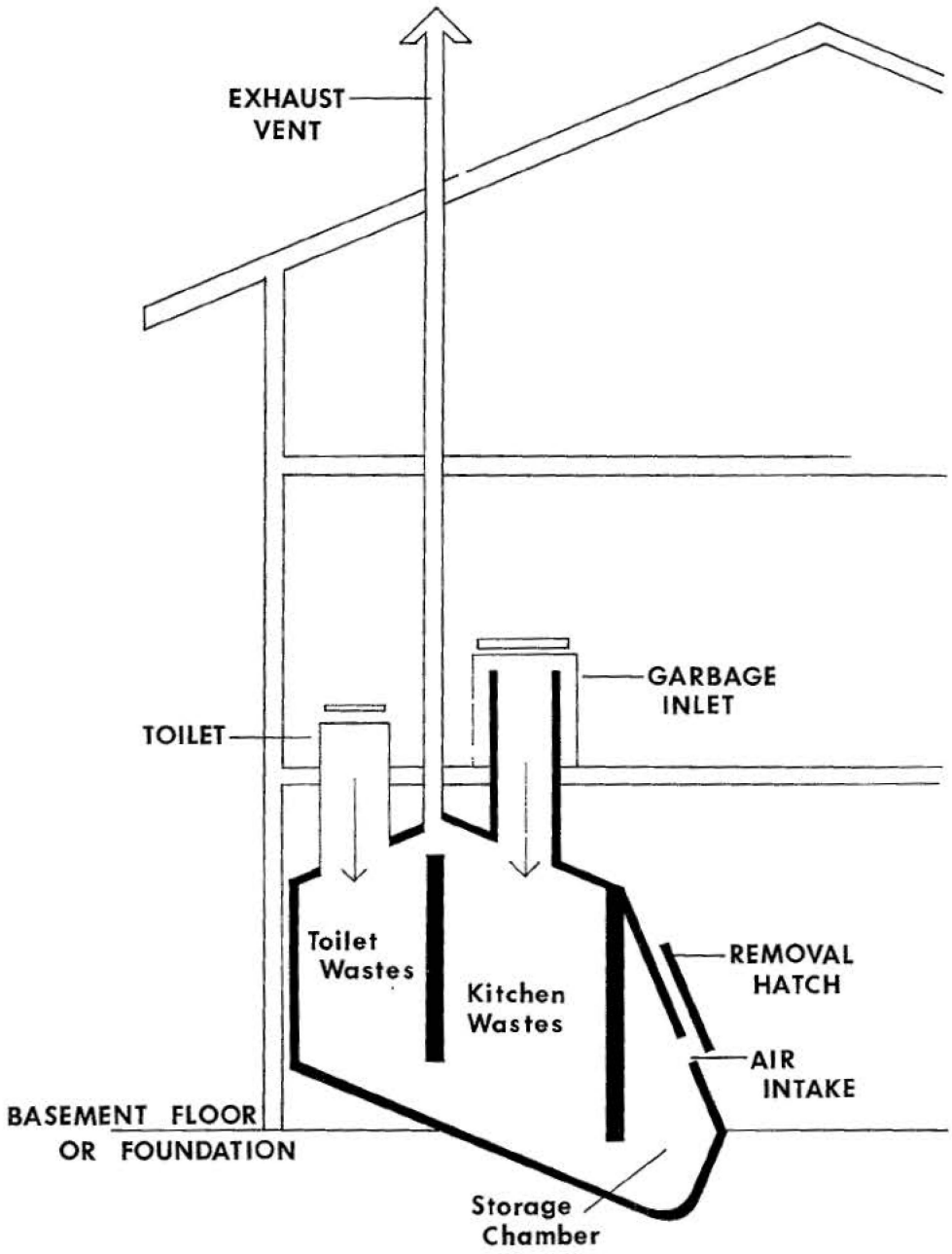
Alternatives to Septic Tanks

What can you do if you live in an area that is unsuitable for the conventional septic tank and tile field? There are other options available, but these are not widely used because the initial cost is generally higher. However, the long-term costs over 10 to 20 years will be less than the cost of correcting a pollution problem that could eventually result from the septic tank system.

In general, one of the cheaper alternatives is the addition of a sand filter following the septic tank. The effluent from the sand filter should be discharged into an absorption field.

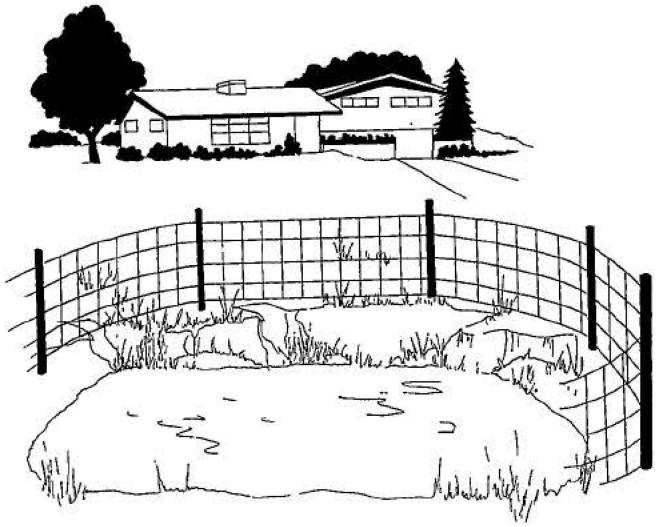


Sand filter



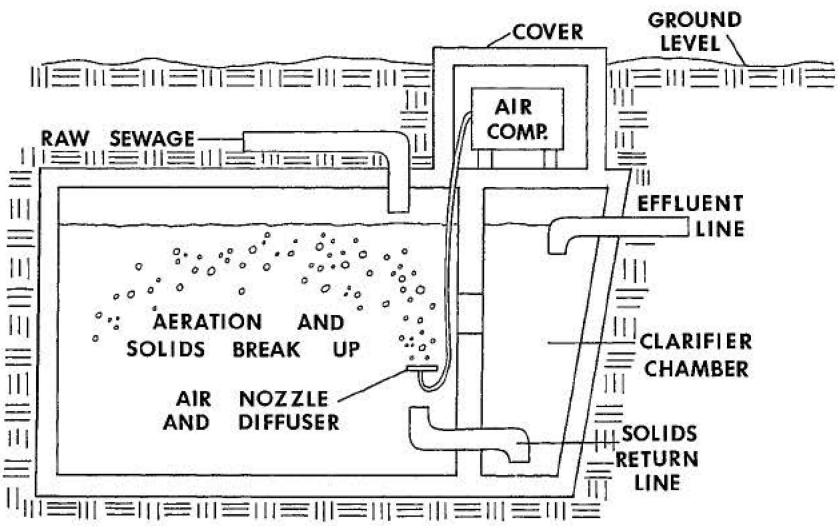
Dry toilet with composting chamber

Several types of dry toilets with composting chambers are also available. These must be used in conjunction with a separate absorption field for "grey" water from dishwashing, laundry, and bathing.



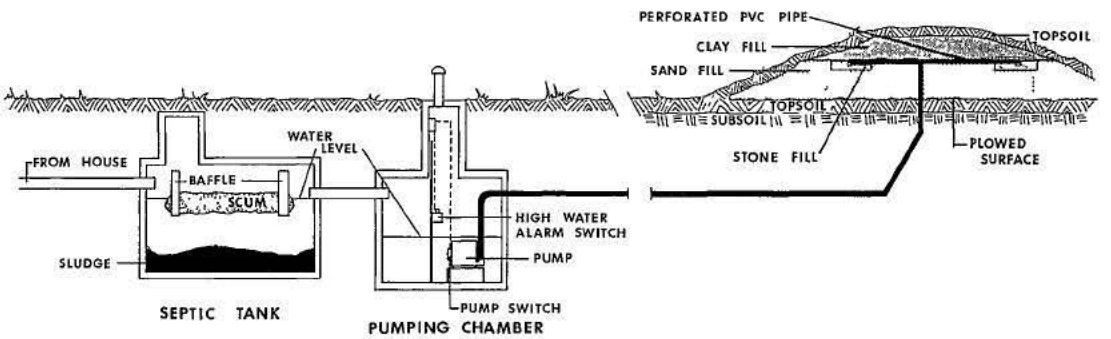
Lagoon

A lagoon may be feasible where soil percolation is too slow for a septic tank absorption field. However, proper lagoon construction and soil compaction is critical. A geologist or soils specialist should always make a site evaluation.



Aerated tank

Many types of aerated tanks are commercially available. The name "aerated septic tank" is a misnomer since "septic" means without oxygen and "aerated" is the addition of oxygen. The aerated tank is not a safe alternative to prevent groundwater pollution where pollution hazard exists. These generally provide only 40-50% reduction in the pollutants found in raw sewage, whereas conventional septic tanks provide about 30% reduction. An absorption field is still required and should be of the same size as recommended for a conventional septic tank. The main benefit of the aerated tank is that it prolongs the life of the absorption field.



Soil Mound

A soil mound may be built to act as the filter field where existing soil is inadequate. The soil mound is constructed by building a soil mound of 3 to 4 feet depth using a soil with suitable characteristics. This often involves obtaining soil from another location. Tile lines are laid in the mound similar to a conventional filter field and grass is grown on the mound surface.

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